Oct. 23, 1934. W. J. McBRIDE 1,978,214

INTERNAL COMBUSTION ENGINE

Filed Dec. 22, 1932 2 Sheets-Sheet 1

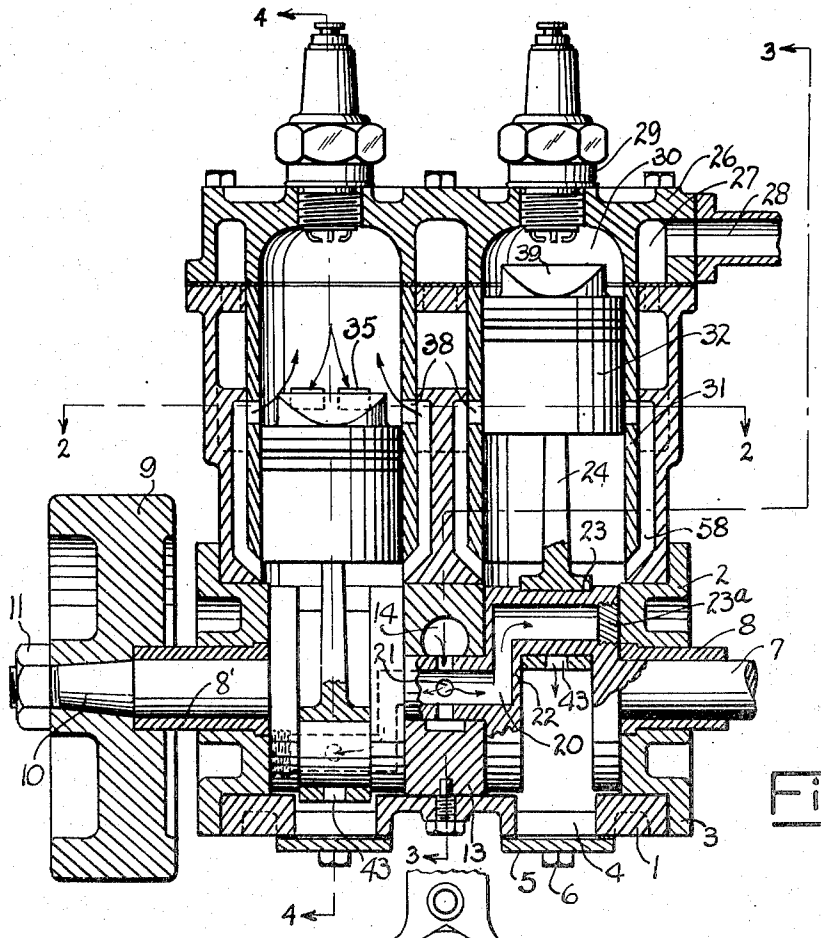

Fig. 1.

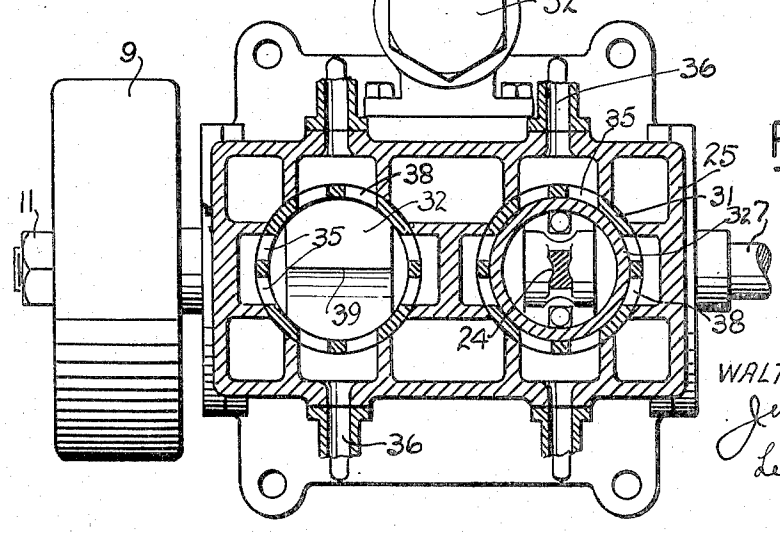

Fig. 2.

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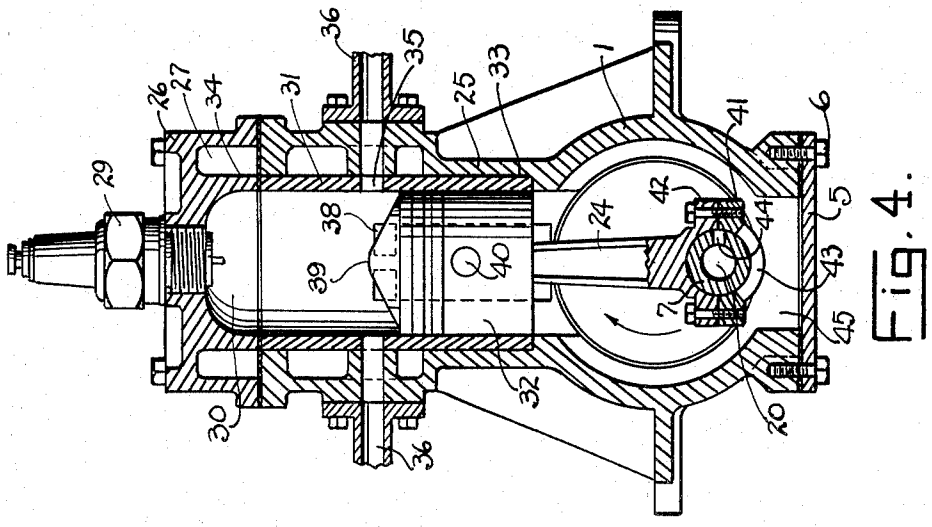

Fig. 4.

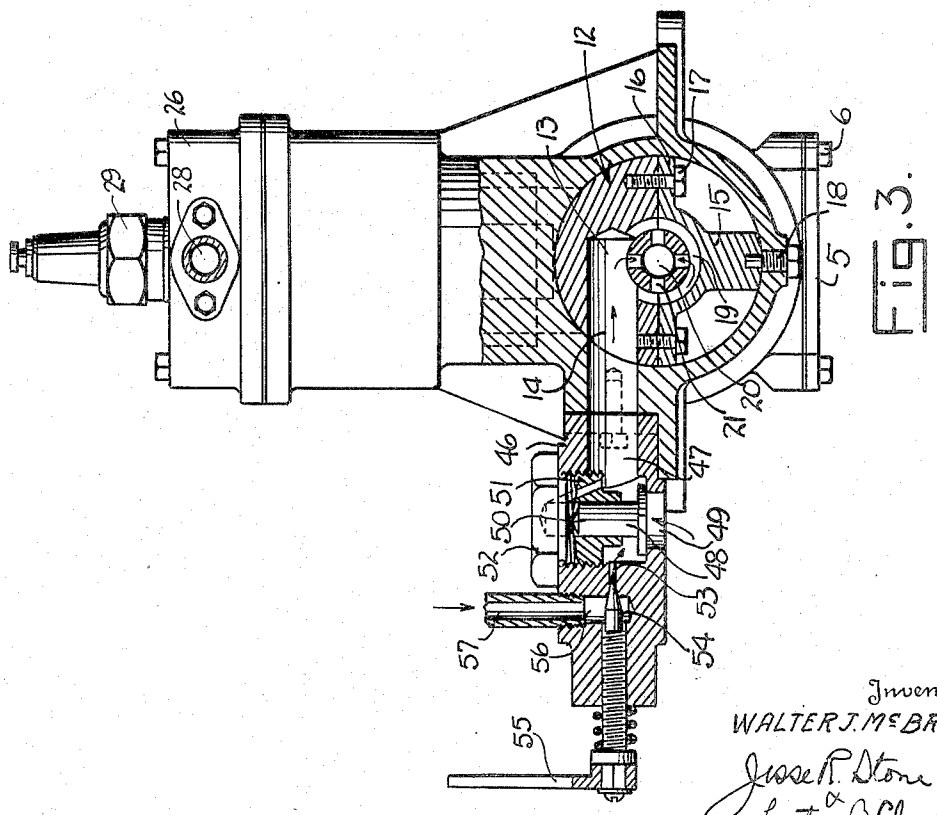

Fig. 3.

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UNITED STATES PATENT OFFICE

1,978,214

INTERNAL COMBUSTION ENGINE

Walter J. McBride, Houston, Tex.

Application December 22, 1932, Serial No. 648,362

5 Claims. (Cl. 123—73)

My invention relates to internal combustion engines, and more particularly to two-cycle engines of this character.

It is an object of the invention to provide means for introducing into the combustion chamber of the engine, a full supply of gas at the proper moment in the movement of the piston in the cylinder and to provide for the free scavenging of the burnt gases from the cylinder.

The invention further contemplates the provision of means for introducing the fuel to the combustion chamber through passages in the crank shaft and the crank case.

I further desire to do away with the operation of valves in the fuel line which ordinarily tend to become clogged and to add to the noise of the operation of the engine.

I also have as an object to so form the piston that it will assist in the directing of the incoming and outgoing gases from the combustion chamber.

In the drawings herewith Fig. 1 is a central longitudinal section through a two-cycle internal combustion motor equipped with my invention.

Fig. 2 is a transverse section on the plane 2—2 of Fig. 1.

Fig. 3 is a side view partly in elevation and partly in section on the plane 3—3 of Fig. 1.

Fig. 4 is a vertical section taken on the plane 4—4 of Fig. 1.

In carrying out my invention I desire to form the engine of extremely simple and strong construction so that it may be cheaply constructed and will last without danger of rapid wear and deterioration. In so doing I form a crank case 1 which, when seen from the end thereof as is shown in Figs. 3 and 4, is partially cylindrical in shape. Each end of the cylindrical case is closed by a circular plate 2 which telescopes within the cylindrical end of the case and has a flange 3 fitting against the end of the case and secured thereto by bolts or other desired means. There is a laterally extending cylinder at each end of the crank case, and I form an opening 4 directly below said cylinder which is closed in use by a plate 5 shown best in Fig. 4, this plate being held in close sealing engagement in the opening by means of cap screws 6. The crank shaft 7 is supported in the end plates 2 by means of bearing sleeves or bushing 8, said bushings are situated within the openings through the plates 2 and may be of desired bearing metal to support the shaft during its rotation. The bushing 8' at one end of the crank case is extended into the recessed inner side of a fly wheel 9 which may be employed in balancing the operation of the motor and may also serve as a pulley in the transmission of power from the engine to some operated device. The principal duty of this wheel is, however, to balance the operation of the motor. Said fly wheel is fitted upon the tapered end 10 of the crank shaft and is held thereon by a nut 11.

Intermediate the ends of the crank case, the shaft is supported by a block or plate 12, the construction of which is shown best in Figs. 1 and 3. With reference particularly to Fig. 3, it will be noted that the block is divided diametrically on a horizontal plane. The upper section 13 of the support block is fitted within the cylindrical interior of the crank case and has a channel or recess 14 extending into the block from one side of the crank case through which the fuel may find entrance to the interior of the crank case. The lower half 15 of the supporting block or plate 12 has two lateral arms 16 which are bolted by cap screws 17 to the upper block 12. The lower arm to which the numeral 15 is applied is secured in position within the crank case by a bolt or screw 18 extending upwardly through the crank case into the said arm 15. Both the upper and lower portions of the supporting block are formed with an annular channel 19 which surrounds the crank shaft and furnishes a passage for fuel from the recess 14 to the crank shaft.

The crank shaft is hollowed out for part of its length to furnish a passage 20 therein for the fuel. There are radial openings 21 from the interior passage to the annular channel 19 so that fuel may enter the interior of the shaft at any time in its rotation. As will be seen from Fig. 1, the interior passage 20 in the crank shaft passes through the crank arms 22 into the wrist pins 23 to which the connecting rods 24 are secured. The ends of the passage 20 are closed by threaded plugs 23a as will be seen particularly from Fig. 1.

The cylinders 25 are shown as two in number. They are preferably formed at their inner ends integrally with the crank case and also integrally with each other. They have at their outer ends a cap plate 26 which acts as a cylinder head on each of the cylinders. There is a water passage 27 about the casings of the cylinders through which cooling water may be circulated through the pipe 28 in the usual manner. At the end of each cylinder, the head of the cylinder is formed with a threaded opening to receive the spark plug 29 of the usual character. The ends of

these spark plugs project into the combustion chamber 30 and into the cylinder heads.

Each cylinder has a liner or sleeve 31 in which the piston 32 reciprocates. This liner is fitted within a recess or seat 33 in the inner wall of the cylinder as shown best in Fig. 4. The upper end of the liner fits against an inner annular flange 34 on the cylinder head thus forming a continuous inner wall for the chamber in which the piston operates.

At opposite sides of the liner 31 are exhaust ports 35 for the burnt gas in the cylinder. Outlets 36 connecting with these ports serve to conduct the exhaust gases to the atmosphere.

On opposite sides of the liner and spaced about 90° from the exhaust ports are the intake ports 38. It will be noted that I have shown two exhaust ports 35 at each side of the liner 31, and two intake ports 38 also therein, it being understood, however, that but one port instead of a pair of ports at each side may be used if desired. The intake ports are spaced slightly lower on the liner than are the exhaust ports as will be noted particularly from Fig. 4, thus allowing the exhaust to take place before the intake ports are fully open.

The pistons 32 are fitted closely within the liner cylinders 31. They are closed at the upper end and have projecting from the upper surface a somewhat wedge-shaped baffle 39. This baffle extends at its ends short of the side of the piston. The ends of the baffle are presented toward the intake ports and the sloping sides are presented toward the exhaust ports. This baffle tends to allow the exhaust gases to flow more freely from the cylinder during the working of the piston.

The connecting rods 24 are secured pivotally through the piston to the wrist pins 40 and the lower end of each connecting rod is secured to the arm of the crank shaft in the usual way by means of a cap plate 41 secured to the flanges 42 on the lower end of the rod.

The lower cap plate 41 of the connecting rod is provided with a slot 43 centrally between its ends to provide a passage which is adapted to register with the radial opening 44 in the crank shaft during the rotation of said shaft so as to allow a passage of fuel through the hollow crank shaft and through the slot 43 to the interior chamber 45 in which the arm of the crank shaft rotates.

As will be seen from Figs. 2 and 3, the fuel line enters the crank case midway between the ends thereof so as to communicate with the passage 14 in the central bearing plate 13. There is a fitting 46 which is connected with the crank case so as to register with the passage 14. This fitting has an interior chamber or passage 47 with an air control valve 48 therein, said valve normally closing the air inlet 49. It is held by gravity in position closing the opening. The stem 50 of the valve is fitted within the guide plug 51 screwed within an opening in the side of the fitting, said opening being closed by cap plug 52. The fuel finds entrance to the chamber 47 through an inlet passage 53 controlled by a needle valve 54 having an arm 55 thereon connected with the throttle lever in the usual manner, not shown. The fuel enters the chamber 56 in which the needle valve operates through the usual fuel line 57. It will be seen that the fuel may be fed into the mixing chamber 47 where air is added thereto and from thence it will pass through the passage 14 and into the crank shaft and from thence to the interior of the crank case.

From thence the gas may pass to the interior of the cylinders through passages 58 in the walls of the cylinders and outside the liners as shown particularly in Fig. 1. I have shown two opposite passages 58 so that there will be a suitable volume of gas conducted into the cylinder above the piston and will assure a free flow of the fuel to the combustion chamber as is indicated in the cylinder at the left of Fig. 1.

In the operation of my device, the fuel will have free entrance to the crank case and from thence to the cylinder at a certain portion of each revolution of the crank shaft. When the explosion takes place driving the piston down to the lower end of its stroke, as shown at the left of Fig. 1, the exhaust ports will be forced open through the passing of the end of the piston by these ports. Immediately thereafter the inlet ports for the new fuel will be opened and the fuel will rush in, as shown by the arrows. This fuel is directed upwardly and will tend to fill the upper portion of the chamber driving the exhaust gases more forcibly from the cylinder through the exhaust ports as will be obvious from the drawings.

It is also to be noted that as the piston moves downwardly the gas in the chamber of the crank case below each piston will be compressed so that such gas will be forcibly projected into the combustion chamber. When on the return stroke the piston moves upwardly the ports will be closed and the gas in the combustion chamber will be compressed adjacent to the spark plugs where it will be evenly ignited. The upward movement of the piston will tend to draw more gas into the crank case below the piston. This will be permitted by the registration of the slot 43 in the bearing of the connecting rod with the opening 44 in the shaft and there will hence be drawn into the chamber in the crank case a plentiful supply of fuel.

It is to be noted that each cylinder is provided with a separate chamber in the crank case, and that this chamber is not large but is entirely sufficient to accommodate the gas required. However, because of its smaller size, it is readily responsive to a demand for fuel as the engine is speeded up and there will therefore be a positive and plentiful feed of fuel to the combustion chamber. It will be seen that there are no poppet valves controlling the entrance of fuel, and that there is no part which will tend to become clogged in the operation of the device. Furthermore, the manner in which the gas is allowed to enter the cylinder while the exhaust gases are being discharged will assist in the complete scavenging of the burnt gases thus tending to keep the cylinder from fouling. The advantages of this construction will be apparent to those skilled in the art.

Having described my invention, what I claim is:

1. A two-cycle internal combustion motor, including a crank case, a crank shaft rotatable therein, said crank shaft having an axial channel therein, a cylinder connected with said crank case, a piston in said cylinder connected with said crank shaft, means including said connection between said piston and crank shaft to control the feed of fuel through said crank shaft to said crank case, inlet passages for fuel from said crank case opening to said cylinders above said piston, and exhaust ports from said cylinder, said ports being controlled by said piston.

2. A two-cycle internal combustion motor including a crank case, a crank shaft rotatable, a crank arm on said crank shaft, a cylinder on said crank case, a piston in said cylinder, a connecting

rod connecting said piston and said crank arm, a fuel passage through said crank shaft and crank arm, to the interior of said crank case, means on said connecting rod to limit the discharge of fuel to said crank case, passage for fuel from said crank case to said cylinder and exhaust ports from said cylinder.

3. A two-cycle internal combustion motor including crank case, a crank shaft rotatable, a crank arm on said crank shaft, a cylinder on said crank case, a piston in said cylinder, a connecting rod connecting said piston and said crank arm, a fuel passage through said crank shaft and crank arm, to the interior of said crank case, an outlet from said crank arm to said crank case for fuel, a bearing sleeve on said connecting rod, said sleeve closing said outlet through part of the rotation of said shaft, a passage for fuel from said crank case to said cylinder and exhaust ports from said cylinder.

4. An internal combustion engine including a crank case, laterally extending cylinders thereon, a crank shaft journalled for rotation in said crank case, a central supporting block in said crank case for said shaft, said shaft having an axial fluid passage therein, means to feed fuel through said block to said passage, pistons in said cylinders, connecting rods for said pistons connected with said shaft and controlling the feed of fuel from said shaft to said crank case, means to conduct fuel from said crank case to said cylinders, and exhaust ports in said cylinders.

5. An internal combustion engine including a crank case, laterally extending cylinders thereon, a crank shaft journalled for rotation in said crank case, a central removable supporting block in said crank case for said shaft, said shaft having an axial fluid passage therein, means to feed fuel through said block to said passage, pistons in said cylinders, connecting rods for said pistons connected with said shaft and means on said rods to control the feed of fuel from said shaft to said crank case.

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